45. The storage medium for storing computer readable instructions according to claim 29 wherein the predetermined coefficients are stored in gamma correction tables, one of the gamma correction tables being selected based upon said outline characteristics.

Please change "compute" to -- computer -- in each of claims 29 through 42.

In the Drawings:

In FIGURE 2, please change "VIDEO BUS CONTROL UNIT" 29 TO "VIDEO PATH CONTROL UNIT."

In FIGURE 2, please change "Template" to "Intensity" in 27b.

REMARKS

New claims 43 through 45 have been added without introducing any new matter to the current application. The subject matter limitations of the newly added dependent claims have been supported by the original disclosures of the current application. The original disclosures on page 9 with respect to FIGURE 5 clearly support the patentable features of the newly added claims.

The amendment to claims 29 through 42 is to correct informality and does not change the scope of these claims.

With respect to the specification amendment on page 6, clarification has been made to an unit which performs the intensity conversion based upon the amendment to FIGURE 2.

. With respect to the specification amendment on page 6, clarification has been made to an unit which performs the intensity conversion based upon the amendment to FIGURE 2.
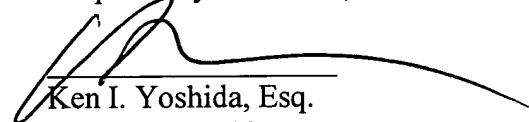
With respect to the specification amendment on page 7, the term "bus" has been changed to "path." The amendment has been necessitated by a translation error. It is clear that the translation error is obvious to one of ordinary skill in the relevant art. The above amendment is permitted as described in MPEP 2163.03 II, Obvious Error.

With respect to the specification amendment on page 8, FIGURE 3 illustrates the detailed components of the space filter process unit 24 as shown in FIGURE 2. The label for reference numbers 27b and 29 has been changed to accurately describe the respective component. Consequently, the description with respect to FIGURE 3 has been amended to clarify the relation between the two already disclosed figures. No new matter has been introduced by the above amendment to the specification. Applicant respectfully requests the entry of the above described amendments in the current application.

Respectfully submitted,

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characteristic values and preprocesses for the subsequent gradation process. In general, the space filter process unit 24 includes the following major functions such as MTF correction, a smoothing process 24a and edge detection 24c and setting a threshold values for intensity changes 24b. The output from the space filter process unit 24 includes the filtered image data and the edge information for outline or contour portions of the image. As necessary, an intensity correction unit 25 corrects the intensity level of the image data based upon the above edge information. The intensity correction unit 25 generally corrects the intensity in the scanned intensity for regenerating the image based upon the standard intensity. As described above, the intensity correction unit 25 utilizes a previously stored conversion data from RAM. For an outline intensity correction unit 25a and a non-outline intensity correction unit 25b, a desired set of conversion data is separately downloaded from the RAM.

A gradation unit 26 converts the intensity data of one pixel into area gradation data according to an outputting characteristic. The conversion includes simple multiple values, binarization, dithering, error diffusion and phase control. To convert to the area degradation data, quantization thresholds are distributed in a predetermined area. To distribute the thresholds, predetermined values are downloaded into a matrix RAM 26A, and a desired quantization set is used based from the matrix RAM 26A upon a processing mode. A pixel correction unit 27a in a write control block 27 smoothes over edges in the image data. Prior to modulation, an intensity conversion unit 27a performs an intensity conversion process for onset characteristics is performed on electrical signals for forming an image to increase the reproduction fidelity of dots. In a PWM modulation unit 27c performs pulse width sub modulation for a writing laser. The pulse width modulation is coordinated with the phase control in the gradation control unit 26 in order to realize the smooth transitions between concentrated dots and distributed dots. Finally, a writing unit 28 forms an image on a photo receptor drum via laser, transfers the image onto an image recording medium and fixes the transferred image in order to reproduce the original image. In the above described preferred embodiment, the writing unit 28 is implemented as a laser printer. In an alternative embodiment with a writing unit such as an ink jet, although the smoothing for reproducing dots and the intensity conversion control are common with the preferred embodiment, a development method requires that the PWM modulation unit 27c be different.

Still referring to FIGURE 2, the preferred embodiment of the image processing apparatus according to the current invention also includes other units. An operation unit 32

5   allows a user or an external unit to specify an operation mode or a processing mode as well as operation or intensity correction parameters. Based upon the specified operation mode, the selection is made in the setting of the gradation process, the scanner gamma correction process, the intensity correction of the scanned image data and the writing intensity control. The processing mode is selected based upon a type of a document, and the type is

10   determined based upon an amount of text or picture. The intensity correction parameters are also set based upon the intensity level of the original document. In the preferred embodiment, in response to the operation mode from the operation unit 32, the system control is implemented by storing the operation mode value and the correction parameter values in RAM via CPU and setting a processing path in a corresponding unit via a system

15   bus. In each image signal, although the bus control is physically in one unit, the control is logically divided into smaller units.

A first function of a video ~~bus~~ path control unit 29 is to control the signals indicative of a scanned image. When the signal is 8-bit after the A/D conversion via the CCD, the

20   ~~bus~~ path control is performed with the same bit width. Through the ~~bus~~ path control, an external application interface 30 controls an external application such as a scanner application program. Via a memory interface unit 31, data is stored in or read from a scanner buffer memory. A second function of the video ~~bus~~ path control unit 29 is to control a data ~~bus~~ path after the image data has been processed. During the image processing, the bid width is

25   converted to either binary or a plurality of multi values. To accommodate the bit width of the data bus, the process controls the data. Although the video ~~bus~~ path control unit 29 controls input and output signals from an external application via the external application interface unit 30, output signals such as a fax transmission and a print out from a personal computer are implemented with binary image data. Via the memory interface unit 31, data is stored

30   in or read from a printer buffer memory. The data is transmitted according to a number of bits in the writing unit.

Now referring to FIGURE 3, a diagram illustrates one preferred embodiment of a
sharpness adjustment unit or a space filter process unit according to the current invention. In
general, the image data is processed based upon the information on edges and intensity from a
5   space filter process unit. After the scanned image data is corrected, the corrected image data is
grouped into a plurality of lines of data in a line memory unit 33 to form an image matrix 34
for accessing the image data on a two-dimensional basis. A front filter 35 filters the image
matrix data to primarily remove aliasing distortions due to the A/D conversion and
unnecessary frequency bands. After the above distortions are removed from a wide range of
10   the signal frequencies, an edge detection unit 36 performs an edge detection process on the
image data. A set of a first MTF correction unit 37a, a second MTF correction unit 37b and a
third MTF correction unit 37c also performs a main filter process on the image data. To
distinguish outline or edge portions of the image data from non-outline or non-edge
portions of the image data, an edge detection unit 36 detects valid edges within the image.
15   Since the front filter 35 has removed noise, a majority of the detected edges is valid.
However, only outlines are selected from the detected edges.

The above main filter process includes an emphasis filter group for the MTF
correction, an original data pass filter after the front filter process and a smoothing filter.
20   The original data pass filter is also used for determining intensity information on
unprocessed pixels. The emphasis filter applies a plurality of filter coefficient to the same
image in parallel. To select one of the processed results, the intensity information is used
to define a strong emphasis result. Using the emphasis filter result, a 1/N weak correction
unit 38 applies a 1/Nth correction amount to generate a weak emphasis result. A smooth
25   process unit 39 further filters out a wide range of the input data to generate smoothly
transitioned pixel positions by effectively eliminating the noise. Among the strong
emphasis result, the weak emphasis result and the smoothed result, an edge processing unit
40 applies an appropriate process based upon an edge signal that is indicative of an outline
portion. Based upon the edge signal and the image reproduction mode from the
30   operational unit, the selection pass path is switched.

Now referring to FIGURE 4, a diagram illustrates a selection criterion for the
MTF correction process according to the current invention. The emphasis filter group unit

23. The system for processing image data according to claim 20 wherein the user input values include customize data.

24. The system for processing image data according to claim 20 wherein the user input values include a background removal signal.

25. The system for processing image data according to claim 15 wherein said space filter process unit further determines an image intensity level of the portion of the image data prior to applying the selected correction coefficient and selects the correction coefficient from the set of the predetermined correction coefficients based upon the outline characteristic and the image intensity level.

26. The system for processing image data according to claim 25 further comprises a storage unit connected to said intensity correction unit for storing the predetermined correction coefficients in a table format.

27. The system for processing image data according to claim 15 wherein said space filter process unit further determines whether or not the outline portion has a particular direction.

28. The system for processing image data according to claim 27 wherein the particular direction includes a right edge, a left edge, a horizontal edge and a vertical edge, said space filter process unit generating corresponding edge information.

29. A storage medium for storing ~~compute~~ computer readable instructions for processing image data, the computer instructions performing the steps of:

inputting user input values;

determining whether or not a portion of image data is an outline portion to generate an outline characteristic;

selecting a correction coefficient from a set of predetermined correction coefficients based upon the outline characteristic and the user input values; and

applying the selected correction coefficient to the portion of the image data.

30. The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein the image data is scanned.

31. The storage medium for storing ~~compute~~ computer readable instructions according to claim 30 further comprising an additional step of correcting the scanned image data prior to said applying step.

32. The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said correction coefficients include intensity correction coefficients.

33. The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said correction coefficients include sharpness correction coefficients.

34.   The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said user input values include an intensity notch signal.

35.   The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said user input values include an image type signal.

36.   The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said user input values include customize data.

37.   The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said user input values include a background removal signal.

38.   The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 further comprising additional instructions for performing the steps:

further determining an image intensity level of the portion of the image data prior to said applying step; and

selecting said correction coefficient from said set of said predetermined correction coefficients based upon said outline characteristic and said image intensity level.

40. The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said predetermined correction coefficients are previously stored in a table.

41. The storage medium for storing ~~compute~~ computer readable instructions according to claim 29 wherein said determining step further determines whether or not said outline portion has a particular direction.

42. The storage medium for storing ~~compute~~ computer readable instructions according to claim 41 wherein said particular direction includes a right edge, a left edge, a horizontal edge and a vertical edge, corresponding edge information being generated.

43. The method of processing image data according to claim 1 wherein the predetermined coefficients are stored in gamma correction tables, one of the gamma correction tables being selected based upon said characteristics.

44. The system for processing image data according to claim 26 wherein said storage unit stores the predetermined coefficients in a plurality of gamma correction tables, said space filter process unit selecting one of the gamma correction tables being based upon the outline characteristics and the image intensity level.

45. The storage medium for storing computer readable instructions according to claim 29 wherein the predetermined coefficients are stored in gamma correction tables, one of the gamma correction tables being selected based upon said outline characteristics.